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(54) Stable emulsions comprising a hydrophobic liquid ingredient

(57) Aqueous emulsions are disclosed which comprise a hydrophobic liquid ingredient or mixtures thereof, a hydrophobic surfactant and a hydrophilic amine oxide surfactant. The emulsions disclosed deliver improved physically stability.

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Description

Technical field

The present invention relates to aqueous emulsions comprising a hydrophobic liquid ingredient.

Background

Cleaning compositions comprising hydrophobic ingredients such as bleaching compositions comprising bleach activators have been extensively described in the art.

More particularly, it is known to formulate bleaching compositions, if they comprise a hydrophobic ingredient like a bleach activator, as an emulsion of nonionic surfactants, see for instance EP-A- 598 170. In said compositions the bleach activator reacts with hydrogen peroxide to yield a peracid which is the bleaching species.

However a drawback associated with liquid compositions comprising hydrophobic ingredients, e.g. bleaching compositions comprising bleach activators, is that they may decompose, i.e., undergo a phase separation upon long storage period. Indeed, hydrophobic liquid ingredients like bleach activators or aqueous insoluble or sparingly soluble organic peroxy acids are problematic to use in an aqueous composition as said composition tends to separate into two different layer phases which can be visualised by the consumer.

It is thus an object of the present invention to provide a composition comprising a hydrophobic liquid ingredient, especially a bleaching composition comprising a hydrophobic liquid ingredient, with improved physical stability.

The present invention meets the above object in proposing an aqueous emulsion having a pH of not more than 7, comprising a hydrophobic liquid ingredient emulsified in said emulsion by a mixture of a hydrophilic amine oxide surfactant and a hydrophobic surfactant. Indeed, it has now been found that the presence of said hydrophilic amine oxide surfactant gives to an emulsion comprising a hydrophobic liquid ingredient such as a bleach activator and/or a hydrophobic source of active oxygen, and a hydrophobic surfactant an increased physical stability, compared to the same emulsion without said hydrophilic amine oxide surfactant or to the same emulsion but with another hydrophilic surfactant like a hydrophilic nonionic surfactant instead of said hydrophilic amine oxide surfactant.

An advantage of the present invention is that it allows for great flexibility in formulating. Indeed, the present invention allows to incorporate any kind of hydrophobic liquid ingredient such as a hydrophobic source of active oxygen (e.g., diperdodecanoic acid) and/or a bleach activator, in an aqueous composition through emulsification. Although the present invention finds a preferred application in formulating bleaching compositions comprising bleach activators and/or hydrophobic sources of active oxygen, the present invention is also applicable to the formulation of aqueous compositions which comprise any hydrophobic liquid ingredient like perfumes.

Another advantage of the present invention is that, due to the presence of hydrophilic amine oxide surfactants and hydrophobic surfactants like nonionic surfactants, particularly good performance in removing different types of soils including bleachable stains, greasy stains, enzymatic stains in laundry application as well as bacterial soils in household cleaning application is provided.

A further advantage of the present invention is that the bleaching emulsions herein are also chemically stable.

EP-A-598 170 discloses aqueous cleaning and bleaching compositions (pH 0.5-6) comprising hydrogen peroxide and a hydrophobic liquid ingredient, said hydrophobic liquid ingredient being emulsified by a mixture of two nonionic surfactants having different HLB. EP-A-598 170 further mentions that said compositions are preferably free of other surfactant types. No amine oxide surfactants are disclosed.

Co-pending European patent application n° 94870184.2 discloses a thickened acidic composition comprising a source of active oxygen, a quaternary ammonium and a C6-C10 amine oxide. This patent application mentions that other surfactants of all types may be added. However, no emulsions are disclosed.

WO 95/20028 discloses grease emulsifying dishwashing compositions comprising a C10-C22 amine oxide surfactant and a detergent surfactant selected from the group of anionic, nonionic, amphoteric and zwitterionic surfactants. Chlorine and oxygen beaches are mentioned as optional ingredients without further specifying them. No emulsion is expressly disclosed.

EP-A- 92 932 discloses a composition suitable for use in bleaching or disinfection containing hydrogen peroxide and a specific bleach activator, said composition being in the form of an emulsion. The emulsifier may be fatty acid esters or fatty ethers or amines of a polyhydroxy substituted compound or a polyethoxylate. No amine oxide surfactants are disclosed.

US-4 541 944 discloses emulsions comprising hydrogen peroxide, a specific bleach activator and an emulsifier, said emulsifier having an HLB being substantially the same as that of the activator. Such emulsifiers include ethoxylated nonionic surfactants. Other surfactants include nonionic, cationic, anionic and amphotheric surfactants. No amine oxide surfactants are disclosed.

EP-A-610 010 discloses an aqueous bleaching composition comprising a water insoluble peroxy acid (e.g. an imido peroxycarboxylic acid), a water immiscible solvent, said solvent comprising the dispersed phase of a solvent/water

emulsion. Said compositions may further comprise surfactants like anionic surfactants and/or ethoxylated nonionic surfactants. No amine oxide surfactants are disclosed.

GB 1 092 149 discloses alkaline stable oil-in-water emulsions (pH 11.7 to 13) of nonionic surfactants (e.g. ethoxylated nonionic surfactant) and a detergent surfactant being selected from the group of sultaine detergent, phosphine oxide detergent and amine oxide detergent. Said compositions may comprise other ingredients like a germicide.

Summary of the invention

The present invention is an aqueous emulsion having a pH of no more than 7, comprising a hydrophobic liquid ingredient and an emulsifying system comprising a hydrophilic amine oxide surfactant and a hydrophobic surfactant.

The present invention also encompasses a process for the manufacture of said emulsion.

Detailed description of the invention

The emulsions according to the present invention are aqueous. Accordingly, the emulsions according to the present invention comprise from 10% to 95% by weight of the total emulsion of water, preferably from 30% to 90%, most preferably from 50% to 70%. Deionized water is preferably used.

The emulsions of the present invention are formulated at a pH of no more than 7. Formulating the emulsions according to the present invention in this acidic pH range contributes to the stability of the emulsion. In a preferred embodiment, the emulsions are formulated at a pH below 7, preferably of from 0 to 5, and more preferably of from 0 to 4. The pH of the emulsion can be trimmed by all means available to the man skilled in the art.

The emulsions according to the present invention comprise, as an essential element, a hydrophobic liquid ingredient, or mixtures thereof. As used herein, the term "hydrophobic liquid ingredient" refers both to liquid ingredients, and solid materials which are dissolved in a hydrophobic liquid phase prior to incorporation into the emulsions of the invention. By hydrophobic, it is meant herein any material which is not substantially and stably miscible in water. Hydrophobic ingredients herein typically have an HLB below 11, preferably below 10.

Suitable hydrophobic liquid ingredients to be used herein include bleach activators, hydrophobic sources of active oxygen, perfumes, hydrophobic solvents, enzymes, hydrophobic radical scavengers, hydrophobic chelating agents, hydrophobic brighteners, polymers and mixtures thereof. As used herein, the term hydrophobic liquid ingredient refers to single ingredients or mixtures thereof.

Preferred hydrophobic liquid ingredients to be used in the emulsions according to the present invention include a hydrophobic source of active oxygen, or mixtures thereof.

The source of active oxygen according to the present invention acts as an oxidising agent, it increases the ability of the emulsions to remove colored stains and organic stains in general, to destroy malodorous molecules and to kill germs.

Suitable hydrophobic sources of active oxygen to be used herein include hydrophobic dialkylperoxides, hydrophobic diacylperoxide, hydrophobic preformed percarboxylic acids, as well as hydrophobic organic and inorganic peroxides. Suitable hydrophobic organic peroxides include hydrophobic diacyl and dialkyl peroxides such as dibenzoyl peroxide, dilauroyl peroxide, dicumyl peroxide, and all peroxides with a number of carbon above 7, or mixtures thereof. Suitable hydrophobic preformed peroxyacids for use in the emulsions according to the present invention include diperoxydodecandioic acid (DPDA), magnesium perphthalic acid, perlauric acid, diperoxyazelaic acid and all peracids with a number of carbon above 7, or mixtures thereof.

Other preferred hydrophobic liquid ingredients to be used in the emulsions according to the present invention are bleach activators. By bleach activator, it is meant herein any compound which reacts with hydrogen peroxide to form a peracid. In the case of bleach activators, such hydrophobic bleach activators typically belong to the class of esters, amides, imides, or anhydrides. Examples of suitable compounds of this type are disclosed in British Patent GB 1 586 769 and GB 2 143 231 and a method for their formation into a prilled form is described in European Published Patent Application EP-A-62 523. Suitable examples of such compounds to be used herein are tetracetyl ethylene diamine (TAED), sodium 3,5,5 trimethyl hexanoyloxybenzene sulphonate, diperoxy dodecanoic acid as described for instance in US 4 818 425 and nonylamide of peroxyadipic acid as described for instance in US 4 259 201 and n-nonanoyloxybenzenesulphonate (NOBS). Also suitable are N-acyl caprolactam selected from the group consisting of substituted or unsubstituted benzoyl caprolactam, octanoyl caprolactam, nonanoyl caprolactam, hexanoyl caprolactam, decanoyl caprolactam, undecenoyl caprolactam, formyl caprolactam, acetyl caprolactam, propanoyl caprolactam, butanoyl caprolactam pentanoyl caprolactam or mixtures thereof. A particular family of bleach activators of interest was disclosed in EP 624 154, and particularly preferred in that family is acetyl triethyl citrate (ATC). Acetyl triethyl citrate has the advantages that it is environmentally friendly as it eventually degrades into citric acid and alcohol. Furthermore, acetyl triethyl citrate has a good hydrolytical stability in the product upon storage and it is an efficient bleach activator. Finally, it provides good building capacity to the composition. As used herein and unless otherwise specified, the term bleach activator includes mixtures of bleach activators.

The emulsions according to the present invention comprise from 0.1% to 40% by weight of the total emulsion of said liquid hydrophobic ingredient, or mixtures thereof, preferably from 0.1% to 20%, and more preferably from 0.1% to 15%.

In the emulsions according to the present invention, said hydrophobic liquid ingredient is emulsified therein by means of an emulsifying system comprising a hydrophilic amine oxide surfactant and a hydrophobic surfactant. In the present invention said two different surfactants, i.e., the hydrophilic amine oxide surfactant and the hydrophobic surfactant, have different HLB values (hydrophilic lipophilic balance), and the difference in value of the HLBs of said two surfactants is preferably at least 1, more preferably at least 3.

Thus, the emulsions according to the present invention comprise, as an essential element, a hydrophobic surfactant, or mixtures thereof. By "hydrophobic surfactant" it is meant herein a surfactant having an HLB below 11, preferably below 10, more preferably below 9. Particularly preferred to be used herein are hydrophobic nonionic surfactants. Indeed, the hydrophobic nonionic surfactants to be used herein have excellent grease cutting properties, i.e. they have a solvent effect which contributes to hydrophobic soils removal.

Accordingly, the emulsions according to the present invention comprise from 0.1% to 30% by weight of the total emulsion of said hydrophobic surfactant or mixtures thereof, preferably from 1 % to 15% and more preferably from 1% to 10%.

Suitable hydrophobic nonionic surfactants for use herein include alkoxylated fatty alcohols preferably, fatty alcohol ethoxylates and/or propoxylates. Indeed, a great variety of such alkoxylated fatty alcohols are commercially available which have very different HLB values (hydrophilic lipophilic balance). The HLB values of such alkoxylated nonionic surfactants depend essentially on the chain length of the fatty alcohol, the nature of the alkoxylation and the degree of alkoxylation. Hydrophobic nonionic surfactants suitable to be used herein tend to have a low degree of alkoxylation and a long chain fatty alcohol. Surfactants catalogs are available which list a number of surfactants including nonionics, together with their respective HLB values.

Suitable chemical processes for preparing the nonionic surfactants for use herein include condensation of corresponding alcohols with alkylene oxide, in the desired proportions. Such processes are well known to the man skilled in the art and have been extensively described in the art. As an alternative, a great variety of alkoxylated alcohols suitable for use herein is commercially available from various suppliers.

Preferred hydrophobic nonionic surfactants to be used in the emulsions according to the present invention are surfactants having an HLB below 11 and being according to the formula $RO-(C_2H_4O)_n(C_3H_6O)_mH$, wherein R is a C_6 to C_{22} alkyl chain or a C_6 to C_{28} alkyl benzene chain, and wherein n+m is from 0.5 to 6 and n is from 0 to 6 and m is from 0 to 6 and preferably n+m is from 0.5 to 5 and, n and m are from 0 to 5. The preferred R chains for use herein are the C_8 to C_{22} alkyl chains. Accordingly, suitable hydrophobic nonionic surfactants for use herein are Dobanol ^{R} 91-2.5 (HLB= 8.1; R is a mixture of C_9 and C_{11} alkyl chains, n is 2.5 and m is 0), or Lutensol ^{R} TO3 (HLB=8; R is a mixture of C_{13} and C_{15} alkyl chains, n is 3 and m is 0), or Tergitol ^{R} 25L3 (HLB= 7.7; R is in the range of C_{12} to C_{15} alkyl chain length, n is 3 and m is 0), or Dobanol ^{R} 23-3 (HLB=8.1; R is a mixture of C_{12} and C_{13} alkyl chains, n is 3 and m is 0), or Dobanol ^{R} 23-2 (HLB= 6.2; R is a mixture of C_{12} and C_{13} alkyl chains, n is 2 and m is 0), or mixtures thereof. Preferred herein are Dobanol ^{R} 23-3, or Dobanol ^{R} 23-2, Lutensol ^{R} TO3, or mixtures thereof. These Dobanol ^{R} surfactants are commercially available from SHELL. These Lutensol ^{R} surfactants are commercially available from BASF and these Tergitol ^{R} surfactants are commercially available from UNION CARBIDE.

Other suitable hydrophobic nonionic surfactants to be used herein are non alkoxylated surfactants. An example is Dobanol ^{R} 23 (HLB<3).

The emulsions according to the present invention comprise, as a further essential element, a hydrophilic amine oxide surfactant, or mixtures thereof. Suitable hydrophilic amine oxide surfactants to be used according to the present invention are amine oxide surfactants having the following formula $R_1R_2R_3NO$ wherein R1 is a C6 to C24 alkyl group, preferably a C6 to C18 alkyl group and more preferably a C6 to C12, and wherein R2 and R3 are independently substituted or unsubstituted, linear or branched alkyl groups of from 1 to 4 carbon atoms, preferably of from 1 to 3 carbon atoms and more preferably are methyl groups. R1 may be a linear or branched alkyl group, being saturated or unsaturated. Suitable amine oxide surfactants for use herein are preferably compatible with any source of active oxygen. Preferred amine oxide surfactants for use herein are for instance natural blend C8/C10 amine oxide available from Hoechst or C12 amine oxide available from Hoechst.

The emulsions according to the present invention comprise from 0.1% to 40% by weight of the total emulsion of a hydrophilic amine oxide surfactant, or mixtures thereof, preferably of from 0.5% to 30% and more preferably of from 1% to 10%.

The emulsions according to the present invention may further comprise other surfactants like anionic surfactants, other nonionic surfactants, zwitterionic surfactants and/or amphotheric surfactants. Said additional surfactants should however not significantly alter the weighted average HLB value of the overall emulsion. Also the level of the different surfactants present may be chosen so as to formulate emulsions with different viscosities. Thus by appropriately choosing the level of the different surfactants, the viscosity of the emulsion may be increased and thus may be particularly suitable to be used on inclined surfaces such as bath tubs, sinks or toilet bowls.

In a preferred embodiment of the emulsions of the present invention, the emulsifying system meets the equation:

$$HLB(X) = \frac{weight\%A}{100} \times HLB(A) + \frac{weight\%B}{100} \times HLB(B) \text{ and weight } \%A + weight\%B = 100\%;$$

where HLB (X) refers to the HLB of the hydrophobic ingredient to emulsify, if several hydrophobic ingredients are present X refers to the all of them (weighted average based on % of each ingredient in the formula), HLB (A) refers to the HLB of said hydrophilic amine oxide surfactant, or mixtures thereof, and HLB (B) refers to the HLB of said hydrophobic surfactant, or mixtures thereof.

The emulsions of the present invention are physically stable. By "physically stable" it is meant herein that said emulsions do not undergo a phase separation after storage at 50°C for a period of two weeks. Physical stability may also be measured by spectrophotometry. In this test method emulsions are submitted to a temperature gradient. Starting from room temperature the emulsions temperature is increased by 0.1 °C per minute up to when a phase separation occurs. The temperature of the phase separation is called Cloud Point Temperature CPT. This temperature can be detected spectrometrically due to a transmittance jump that occurs concomitantly to the emulsion phase separation.

The emulsions of the present invention comprise as an optional but highly preferred ingredient a hydrophilic source of active oxygen, or mixtures thereof. The presence of said hydrophilic source of active oxygen, in particular hydrogen peroxide, is highly desired when said hydrophobic liquid ingredient is a bleach activator. Suitable hydrophilic source of active oxygen include hydrogen peroxide or a water soluble source thereof. As used herein a hydrogen peroxide source refers to any compound which produces hydrogen peroxide when said compound is in contact with water. Suitable water-soluble inorganic sources of hydrogen peroxide for use herein include persulfate, persulfuric acid, percarbonates, metal hydrophilic peroxides, perborates and persilicate salts.

Suitable persulfate salts or mixtures thereof to be used herein according to the present invention, as a source of active oxygen includes monopersulfate triple salt. One example of monopersulfate salt commercially available is potassium monopersulfate commercialised by Peroxide Chemie GMBH under the trade name Curox®. Other persulfate salts such as dipersulfate salts commercially available from Peroxide Chemie GMBH can be used in the emulsions according to the present invention.

In addition, other classes of hydrophilic peroxides can be used as an alternative to hydrogen peroxide and sources thereof or in combination with hydrogen peroxide and sources thereof.

Examples of hydrophilic peroxides include hydrophilic dialkylperoxides, hydrophilic diacylperoxide, hydrophilic preformed percarboxylic acids and hydrophilic organic and inorganic peroxides. Suitable hydrophilic organic peroxides include all peroxides with a number of carbon atoms below or equal to 7, or mixtures thereof. Suitable hydrophilic preformed peroxyacids for use in the emulsions according to the present invention include diperpimelic acid, perbenzoic acid and all peracids with a number of carbons below 7, or mixtures thereof.

The emulsions according to the present invention comprise up to 30% by weight of the total emulsion of said hydrophilic source of active oxygen, or mixtures thereof, preferably from 0.1% to 20%, and more preferably from 0.1% to 15%.

The bleaching emulsions according to the present invention are also chemically stable. By "chemically stable" it is meant herein that an emulsion comprising a source of active oxygen such as for instance a persulfate salt, does not undergo more than 20 % persulfate loss, in one month at 25°C. Persulfate concentration can be measured by titration with potassium permanganate after reduction with a solution containing ammonium ferrous sulphate. Said stability test method is well known in the art and is reported, for example, on the technical information sheet of Curox® commercially available from Interox. Alternatively persulfate concentration can also be measured using a chromatography method described in the literature for peracids (F. Di Furia et al., Gas-liquid Chromatography Method for Determination of Peracids, Analyst, Vol 113, May 1988, p 793-795).

The emulsions according to the present invention may also comprise optional ingredients including dyes, hydrophilic brighteners, builders, pigments, soil release agents, dye transfer inhibitors, solvents, buffering agents and the like.

The emulsions according to the present invention may further comprise a chelating agent. Suitable cheating agents may be any of those known to those skilled in the art such as the ones selected from the group comprising phosphonate chelating agents, amino carboxylate chelating agents or other carboxylate chelating agents, or polyfunctionally-substituted aromatic chelating agents or mixtures thereof. These chelating agents further contribute to the stability of the peroxygen bleach-containing emulsions herein.

Such phosphonate chelating agents may include etidronic acid (1-hydroxyethylidene-bisphosphonic acid or HEDP) as well as amino phosphonate compounds, including amino alkylene poly (alkylene phosphonate), alkali metal ethane 1-hydroxy diphosphonates, nitrilo trimethylene phosphonates, ethylene diamine tetra methylene phosphonates, and diethylene triamine penta methylene phosphonates. The phosphonate compounds may be present either in their acid form or as salts of different cations on some or all of their acid functionalities. Preferred phosphonate chelating agents

to be used herein are diethylene triamine penta methylene phosphonates. Such phosphonate chelants are commercially available from Monsanto under the trade name DEQUEST®.

Polyfunctionally-substituted aromatic chelating agents may also be useful in the compositions herein. See U.S. patent 3,812,044, issued May 21, 1974, to Connor et al. Preferred compounds of this type in acid form are dihydroxydisulfobenzenes such as 1,2-dihydroxy -3,5-disulfobenzene.

A preferred biodegradable chelating agent for use herein is ethylene diamine N,N'- disuccinic acid, or alkali metal, or alkaline earth, ammonium or substitutes ammonium salts thereof or mixtures thereof. Ethylenediamine N,N'- disuccinic acids, especially the (S,S) isomer have been extensively described in US patent 4, 704, 233, November 3, 1987 to Hartman and Perkins. Ethylenediamine N,N'-disuccinic acid is, for instance, commercially available under the tradename ssEDDS® from Palmer Research Laboratories.

Suitable amino carboxylate cheating agents useful herein include ethylene diamine tetra acetates, diethylene triamine pentaacetates, diethylene triamine pentoacetate (DTPA), N-hydroxyethylethylenediamine triacetates, nitrilotriacetates, ethylenediamine tetraproprionates, triethylenetetraaminehexaacetates, ethanoldiglycines, propylene diamine tetracetic acid (PDTA) and methyl glycine di-acetic acid (MGDA), both in their acid form, or in their alkali metal, ammonium, and substituted ammonium salt forms. Particularly suitable to be used herein are diethylene triamine penta acetic acid (DTPA), propylene diamine tetracetic acid (PDTA) which is, for instance, commercially available from BASF under the trade name Trilon FS® and methyl glycine di-acetic acid (MGDA).

Further carboxylate chelating agents to be used herein include malonic acid, salicylic acid, glycine, aspartic acid, glutamic acid, or mixtures thereof.

Typically, the emulsions according to the present invention comprise up to 5% by weight of the total emulsion of a chelating agent, or mixtures thereof, preferably from 0.01 % to 1.5% by weight and more preferably from 0.01% to 0.5%.

The emulsions according to the present invention may further comprise a radical scavenger. Suitable radical scavengers for use herein include the well-known substituted mono and di hydroxy benzenes and derivatives thereof, alkyl- and aryl carboxylates and mixtures thereof. Preferred radical scavengers for use herein include di-tert-butyl hydroxy toluene, hydroquinone, di-tert-butyl hydroquinone, mono-tert-butyl hydroquinone, tert-butyl-hydroxy anysole, benzoic acid, toluic acid, catechol, t-butyl catechol, 2-methoxy-phenol, 2-ethoxy-phenol, 4-allyl-catechol, 2-methoxy-4-(2-propenyl)phenol, benzylamine, 1,1,3-tris(2-methyl-4-hydroxy-5-t-butylphenyl) butane, as well as n-propyl-gallate. Highly preferred for use herein is di-tert-butyl hydroxy toluene, which is for example commercially available from SHELL under the trade name IONOL CP®. These radical scavengers further contribute to the stability of the peroxygen bleach-containing emulsions herein.

Typically, the emulsions according to the present invention comprise up to 5% by weight of the total emulsion of a radical scavenger, or mixtures thereof, preferably from 0.01% to 1.5% by weight and more preferably from 0.01% to 0.5%.

The present invention further encompasses a process for the manufacture of the emulsions described herein. The process according to the present invention comprises at least three steps:

In the first step, a hydrophobic mixture is prepared which comprises at least said hydrophobic surfactant and said hydrophobic liquid ingredient.

In the second step, a hydrophilic mixture is prepared which comprises at least said water, and said hydrophilic amine oxide surfactant. Said hydrophilic mixture preferably further comprises other hydrophilic ingredients which are to be formulated in the emulsion such as hydrophilic source of active oxygen, dyes, optical brighteners, builders, buffering agents, and organic and/or inorganic acids to adjust the pH to the desired value. In this second step the hydrophilic source of active oxygen, if present, is preferably added last, after said buffering agent has been added.

Naturally, said first and said second steps can be performed in any order, i.e. second step first is also suitable.

In the third step of the process according to the present invention, said hydrophobic mixture and said hydrophilic mixture are mixed together.

The present invention is further illustrated by the following examples.

Examples

Emulsions are made which comprise the listed ingredients in the listed proportions (weight %).

	I	II	III	IV	V
Dobanol ® 91-2.5	4.9	4.7	4.9	4.7	4.7
C12 amine oxide	2.1	2.3	2.1	2.3	---
C8/C10 amine oxide	---	---	---	---	2.3
Acetyl triethyl citrate	3.5	---	---	---	---
Hydrogen peroxide	6.0	---	---	---	---
Citric acid	4.0	4.0	---	---	---
Potassium monopersulfate	---	---	6	6	4
Sulfuric acid	---	---	6	6	---
Methanesulfonic acid	---	---	---	---	5
Dibenzoyl peroxide	---	3	---	---	---
Deionized water	----------balance up to 100%----------				

Compositions I to V were obtained which were stable emulsions, both from a chemical and a physical standpoint. Also, these emulsions deliver excellent cleaning performance on hard-surfaces and in laundry application.

Compositions I to V are each made by preparing two mixtures. A hydrophilic mixture is prepared which comprises the water, the amine oxide surfactant, citric acid if present, methanesulfonic acid if present, and sulfuric acid if present. Hydrogen peroxide, if present or monopersulfate, if present is added in said hydrophilic mixture as last step. A hydrophobic mixture is prepared which comprises Dobanol R 91-2.5 and acetyl triethyl citrate, if present and dibenzoyl peroxide, if present.

Then said hydrophobic mixture is poured into said hydrophilic mixture, while mixing.

Claims

1. An aqueous emulsion having a pH of no more than 7, comprising a hydrophobic liquid ingredient and an emulsifying system comprising a hydrophilic amine oxide surfactant and a hydrophobic surfactant.

2. An emulsion according to claim 1 wherein said hydrophobic liquid ingredient is a bleach activator, a hydrophobic source of active oxygen, a perfume, a hydrophobic solvent, an enzyme, a hydrophobic radical scavenger, a hydrophobic chelating agent, a polymer, or mixtures thereof.

3. An emulsion according to any of the preceding claims wherein said hydrophobic liquid ingredient is a hydrophobic source of active oxygen preferably selected from the group of hydrophobic dialkylperoxides, hydrophobic diacylperoxide, hydrophobic preformed percarboxylic acids, hydrophobic organic and inorganic peroxides, or mixtures thereof, and/or a bleach activator preferably selected from the group of tetracetyl ethylene diamine, sodium 3,5,5 trimethyl hexanoyloxybenzene sulphonate, diperoxy dodecanoic acid, nonylamide of peroxyadipic acid, n-nonanoyloxybenzenesulphonate, N-acyl caprolactams, acetyl triethyl citrate or mixtures thereof.

4. An emulsion according to any of the preceding claims wherein said emulsion comprises from 0.1% to 40% by weight of the total emulsion of said hydrophobic liquid ingredient, or mixtures thereof, preferably from 0.1% to 20% and more preferably from 0.1% to 15%.

5. An emulsion according to any of the preceding claims wherein said emulsion further comprises a hydrophilic source of active oxygen selected from the group of hydrogen peroxide, persulfate, persulfuric acid, percarbonates, metal hydrophilic peroxides, perborates, persilicate salts, or mixtures thereof, and preferably is hydrogen peroxide or monopersulfate.

6. An emulsion according to claim 7 wherein said emulsion comprises from 0.1% to 30% by weight of the total emulsion of said hydrophilic source of active oxygen or mixtures thereof, preferably from 0.1% to 20% and more preferably from 0.1% to 15%.

7. An emulsion according to any of the preceding claims wherein said hydrophobic surfactant is a surfactant having an HLB up to 11, preferably below 10, and more preferably below 9.

8. An emulsion according to any of the preceding claims wherein said hydrophobic surfactant is a nonionic surfactant.

9. An emulsion according to any of the preceding claims wherein said emulsion comprises from 0.1% to 30% by weight of the total emulsion of said hydrophobic surfactant or mixtures thereof, preferably from 1% to 15% and more preferably from 1% to 10%.

10. An emulsion according to any of the preceding claims wherein said hydrophilic amine oxide surfactant is an amine oxide surfactant having the following formula $R_1R_2R_3NO$ wherein R1 a linear or branched C6 to C24 alkyl group, being saturated or unsaturated, preferably a C6 to C18 alkyl group and more preferably a C6 to C12, and wherein R2 and R3 are independently substituted or unsubstituted, linear or branched alkyl groups of from 1 to 4 carbon atoms, preferably of from 1 to 3 carbon atoms and more preferably are methyl groups.

11. An emulsion according to any of the preceding claims wherein said emulsion comprises from 0.1% to 40% by weight of the total emulsion of said hydrophilic amine oxide surfactant or mixtures thereof, preferably from 0.5% to 30% and more preferably from 1% to 10%.

12. An emulsion according to any of the preceding claims which has a pH below 7, preferably of from 0 to 5 and more preferably of from 0 to 4.

13. A process for the manufacture of an emulsion according to any of the preceding claims wherein:

- a hydrophobic mixture is prepared which comprises at least said hydrophobic surfactant, and said hydrophobic liquid ingredient or mixtures thereof;
- a hydrophilic mixture is prepared which comprises at least water, said hydrophilic amine oxide surfactant and said hydrophilic source of active oxygen, if present;
- said hydrophobic mixture and said hydrophilic mixture are mixed together.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 20 3530

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP-A-0 634 476 (THE PROCTER & GAMBLE CO.) 18 January 1995 * page 4, line 43 - page 5, line 55 * * claims 1,7-12 *	1-9,12, 13	C11D1/825 C11D3/39 C11D11/00
A	EP-A-0 598 693 (THE PROCTER & GAMBLE CO.) 25 May 1994 * page 4, line 42 - page 5, line 46 * * claims 1,6-9 *	1-9,12, 13	
D,A	EP-A-0 598 170 (THE PROCTER & GAMBLE CO.) 25 May 1994 * page 4, line 22 - line 39 * * examples * * claims *	1-9,12, 13	
A	EP-A-0 404 293 (THE CLOROX CO.) 27 December 1990 * page 8, line 3 - page 14, line 21 * * claims 1-6,12 *	1-3,5, 10,11	
A	EP-A-0 385 216 (HENKEL KGAA.) 5 September 1990 * page 2, line 38 - page 3, line 8 * * claims 1,3 *	1,2,5, 10,11	TECHNICAL FIELDS SEARCHED (Int.Cl.6) C11D
A	US-A-3 402 128 (PUCHTA ROLF ET AL.) 17 September 1968 * column 4, line 4 - line 31 * * claims 1-10 *	1,2,5, 10,11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 May 1996	Serbetsoglou, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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